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New Italian records of *Lichenophanes varius* (Illiger, 1801) (Coleoptera, Bostrichidae)

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Abstract

Lichenophanes varius (Illiger, 1801) is a Turanic-European-Mediterranean species. In most of European countries, this species is protected at different levels and it is classified as "NT" (Near Threatened) in the IUCN European Red List of Saproxylic Beetles. In Italy, it is classified as "EN" (Endangered). Its larvae are saproxylophagous and develop in branches and rotting trunks of many broadleaved tree genera. Nevertheless, this beetle seems to attack only wood which is already invaded by the mycelia of *Biscogniauxia* spp. (Pyrenomycetes, Xylariaceae). The Italian distribution and ecology of *L. varius* are updated on the basis of recent records; the species is recorded for the first time from Calabria, where it was reared from *Quercus frainetto* Ten. which represent a new host-plant record for this beetle. Finally, the authors discuss the possibility that global warming can promote a resurgence of attacks from the above mentioned phytopathogenic fungi in Italian forests and, therefore, this climatic change can also favour the populations of this red-listed beetle.

Keywords

Bostrichidae, *Lichenophanes*, protected areas, conservation, faunistic, host plants, Xylariaceae

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Introduction

As *Lichenophanes varius* (Illiger, 1801) (Fig. 1) is classified as "EN" (Endangered) in the Italian Red List of Saproxylic Beetles (Nardi et al. 2014, 2015b), hereunder, new Italian records ("New records") are provided for a better knowledge of its chronogeonemy and ecology. Moreover, considering the rarity of this species throughout Europe (cf. Nieto and Alexander 2010, Przewoźny 2011, Muscarella et al. 2013, Geis 2016), some records from other countries ("Other material examined") are also provided.

Materials and methods

Taxonomy and nomenclature

The beetles were identified following the work by Lesne (1899, 1901) and Muscarella et al. (2013).

The systematics and nomenclature of plants and fungi follow, respectively, The Plant List (2013) and Index Fungorum (2017); families and, within each family, species are listed alphabetically.

Figure 1. Adult of *Lichenophanes varius* from the Nature Reserve Bosco della Fontana (Italy) (photo by G. Scaglioni, 2014).

Data collection and phenology

The information on *L. varius* provided by Muscarella et al. (2013), was hereunder updated with unpublished and literature records. The former were obtained after examination of museum collections where large number of saproxylic beetles collected during recent forest monitoring programmes were present (Audisio and Biscaccianti 2008, Persiani et al. 2010, Della Rocca et al. 2014, Di Santo and Biscaccianti 2014, Hardersen et al. 2014, Parisi 2014, Redolfi De Zan et al. 2014, Faccoli and Montecchio 2015, Macagno et al. 2015, Nardi et al. 2015a, Biscaccianti et al. 2016, Matteucci 2016).

For each record, the following information, when available, is provided: administrative region, commune (province), locality, altitude (metres a.s.l.), geographic coordinates (lat/lon DMS, datum WGS84), biotope, date, collector, additional information on the finding, number of specimens and collection. Possible interpolations are given in square brackets. The labels of the examined specimens are written in Italian; hereunder, the regions, the biotopes and the collecting methods were translated into English. The mainland Italian regions are listed from North to South and from West to East, all toponyms being listed alphabetically.

The monthly Italian phenology of this species (Fig. 2) is based upon all available records from 1867 to 2016 (Muscarella et al. 2013, Nardi and Biscaccianti this paper). As these records are not quantitative, the value attributed to each one was standardised according to the following formula: 1/number of months. For instance, the value of the record for 3.6.2014, is 1/1 = 1, while the value of the record dated 18.5–12.7.2010, is 1/3 = 0.333, and this value was attributed to each of the involved months (May, June and July). In the Fig. 2, the value of a single month is given by the arithmetic sum of the above standardised values of the single month.

Unpublished works according to ICZN (2012) are also listed in the references, but their effective status is reported in square brackets.

Acronyms

Specimen depositories: CAB = A.B. Biscaccianti private collection, Roma; CFA = F. Angelini collection c/o Museo di Storia Naturale dell'Università degli Studi di Firenze, Sezione di Zoologia "La Specola", Firenze; CNBFVR = Centro Nazionale per lo Studio e la Conservazione della Biodiversità Forestale "Bosco Fontana" Carabinieri, Marmirolo (Mantova); CGN = G. Nardi private collection, Cisterna di Latina (Latina); CVV = V. Vomero private collection, Roma; MZAC = Museo di Zoologia ed Anatomia Comparata, Roma Tre Università degli Studi, Roma.

Other abbreviations and recurrent terms used in the text: BCWFT = black cross windows flight trap on a beech tree (*Fagus sylvatica*); Bosco = Wood; es. = specimen/s; ex = emerged from; Monte = Mount; P.N. = Parco Nazionale = National Park; sdb = same data but; TCWFT= transparent cross windows flight trap on a beech tree (*F. sylvatica*).

Results

Lichenophanes varius (Illiger, 1801)

Lichenophanes varius (Illiger, 1801): Evangelista and Cristiano 2013: 250, Muscarella et al. 2013: 455, Redolfi de Zan et al. 2016: 237.

New records. PIEDMONT (Evangelista and Cristiano 2013): Caramagna (Cuneo), Bosco del Merlino, relict deciduous plain forest, between 1996 and 2012, ex branches of *Quercus robur*, many es. LOMBARDY: Marmirolo (Mantova), Nature Reserve Bosco della Fontana, 25 m, 45°12.030'N; 10°44.085'E, *Querco-Carpinetum boreoitalicum* relict forest, 3.6.2014, M. Bardiani and I. Toni leg., unbaited aerial trap on a *Quercus cerris* tree at a height of 13 m from the soil, 1 es. (CNBFVR). LAZIO (cf. Redolfi de Zan et al. 2016): Allumiere (Roma), 573 m, 42°09.112'N; 11°54.560'E, relict forest dominated by beech trees (*Fagus sylvatica*), 19.6.–1.7.2011, G.M. Carpaneto et al. leg., BCWFT, 1 es. (CGN); sdb 612 m, 42°09'05.9"N; 11°54'36.0"E, 2–15.7.2011, TCWFT, 1 es. (CGN); Monti Cimini (Viterbo), Monte Venere, 714 m, 42°20'55.1"N; 12°11'05.4"E, relict forest dominated by beech trees (*F. sylvatica*), 2–15.7.2011, G.M. Carpaneto et al. leg., TCWFT, 1 es (CGN); sdb 829 m, 42°20'43.7"N; 12°10'52.8"E, 1 es. (CGN); Oriolo Romano (Viterbo), 463 m, 42°09'41.8"N; 12°09'14.0"E, relict forest dominated by beech trees (*F. sylvatica*), 19.6.–1.7.2011, G.M. Carpaneto et al. leg., BCWFT, 1 es. (CGN); sdb 2–15.7.2011, 1 es. (MZAC). CAMPANIA (cf. Audisio and Biscaccianti 2008): P.N. Cilento e Vallo di Diano, Montesano sulla Marcellana (Salerno), Bosco Cerreta, 510 m, 40°15'33"N; 15°39'30"E, old-growth forest dominated by *Q. cerris*, 22.7.2008, A.B. Biscaccianti and E. Colonnelli leg., ex branches of *Q. cerris* (collected 22.5.2008) colonized by *Biscogniauxia* sp. [possibly *B. nummularia* (Bull.) Kuntze], 2 es. (CAB). CALABRIA: P.N. Aspromonte, San Luca (Reggio Calabria), Pietra Lunga, Bosco Ferullà, 649 m, 38°10'07'N; 16°02'05'E, old-growth mixed forest dominated by *Q. frainetto* and *Q. ilex*, 14.7.2016, A.B. Biscaccianti, F. Manti and E. Castiglione leg., ex branches of *Q. frainetto* (collected 15–18.3.2016) apparently free of fungi, 1 es. (CAB).

Other material examined. CZECH REPUBLIC: Bohemia, Adamov, 6.[19]69, J. Hladil leg., 1 es. (CFA). FRANCE: Corsica, Corte, 500 m, 23.11.2010, [W.] Pagliacci leg., 8 es. (CVV).

Italian regional distribution. Piedmont (Evangelista and Cristiano 2013), Lombardy, Veneto, Emilia-Romagna, Tuscany, Lazio, Molise, Campania, Apulia, Basilicata, Calabria, Sicily and Sardinia (cf. Audisio and Biscaccianti 2008, Muscarella et al. 2013, Redolfi de Zan et al. 2014, Nardi and Biscaccianti this paper).

Chorotype and distribution. Turanic-European-Mediterranean (cf. Vigna Taglianti et al. 1999, Muscarella et al. 2013). This species is recorded from: Europe (Albania, Armenia, Austria, Azerbaijan, Bosnia-Herzegovina, Bulgaria, Croatia, Czech Republic, Estonia, France (mainland, Corsica), Georgia, Germany, Greece (mainland), Hungary, Italy (mainland, Sardinia and Sicily), Macedonia, Moldavia, Poland, Portu-

gal, Romania, Slovakia, Slovenia, Spain (mainland), Switzerland, Russia (Central Territory and Southern Territory), Turkey, Ukraine), North Africa (Algeria, Egypt, Libya, Morocco, Tunisia) and Asia (Cyprus, Iran, Syria, Turkmenistan, Turkey) (cf. Borowski 2007, Muscarella et al. 2013, Audisio et al. 2015).

Ecology. *Lichenophanes varius* lives in old-growth or at least in well preserved, broadleaved forests, where its saproxylophagous larvae develop in the dead wood of various genera of trees (e.g. *Alnus*, *Carpinus*, *Castanea*, *Fagus*, *Populus*, *Quercus*, *Tilia*) (cf. Muscarella et al. 2013). In Italy, this species was reared from the following plants: *Carpinus betulus* L. (Betulaceae), *Quercus* sp., *Q. cerris* L., *Q. frainetto* Ten., *Q. pubescens* Willd., *Q. robur* L. and *Q. suber* L. (Fagaceae) (cf. Evangelista and Cristiano 2013, Muscarella et al. 2013, Nardi and Biscaccianti this paper). Moreover, *Q. ilex* L., *F. sylvatica* L. (Fagaceae), *Glycyrrhiza glabra* L. (Leguminosae), *Populus* sp. (Salicaceae), *Acer monspessulanum* L. (Sapindaceae) and *Ulmus* sp. (Ulmaceae), are very probably host plants of *L. varius* in Italy, since adults were also collected or trapped on these botanic species (cf. Muscarella et al. 2013, Redolfi de Zan et al. 2014) and, in other countries, this beetle was also reared from most of these plants (cf. Muscarella et al. 2013).

Lichenophanes varius seems to attack only wood invaded by the mycelia of some Xylariaceae fungi (Pyrenomycetes): *Biscogniauxia* sp. on *Quercus cerris* (Nardi and Biscaccianti this paper), *B. mediterranea* (De Not.) Kuntze on *Quercus* sp., and *B. nummularia* on *Fagus sylvatica* (cf. Muscarella et al. 2013). Nevertheless, no mycological data are available for the other host plants. This peculiar larval ecology, as observed for other saproxylophagous beetles (cf. Rejzek and Vlásak 2000, Persiani et al. 2010, Borowski and Pietka 2014), is, probably, one of the causes of the rarity of this Bostrichid.

In Italy, *L. varius* occurs from sea level to the montane belt (1100–1300 m a.s.l.) (cf. Muscarella et al. 2013, Nardi and Biscaccianti this paper); in this country, the decrease of old-growth deciduous plain forests (cf. Mason 2002, Pignatti et al. 2009) is surely another cause of its rarity.

Figure 2 summarises, according to the month of capture, the phenology of all Italian records (cf. Muscarella et al. 2013, Nardi and Biscaccianti this paper). This figure clearly shows that the species is active in May–July, while in Hungary, the adults are active in mid-summer (Németh et al. 2015), and, in the Forest of Fontainebleau (France), they are active in June–September (Cantonnet et al. 1995).

Discussion

A sole specimen of *L. varius* was previously (year 2000) collected in the above-mentioned locality of Lombardy (Nardi and Zahradník 2004), despite this site, since 1995, was being the subject of accurate entomological research (cf. Mason et al. 2001, 2002, Cerretti et al. 2004, Mason et al. 2006, Stireman et al. 2011, Birtele and Hardersen 2012, Chiari et al. 2013, D'Amen et al. 2013, Hardersen et al. 2014). The latest specimen (year 2014) from this locality was collected during the LIFE Project MIPP

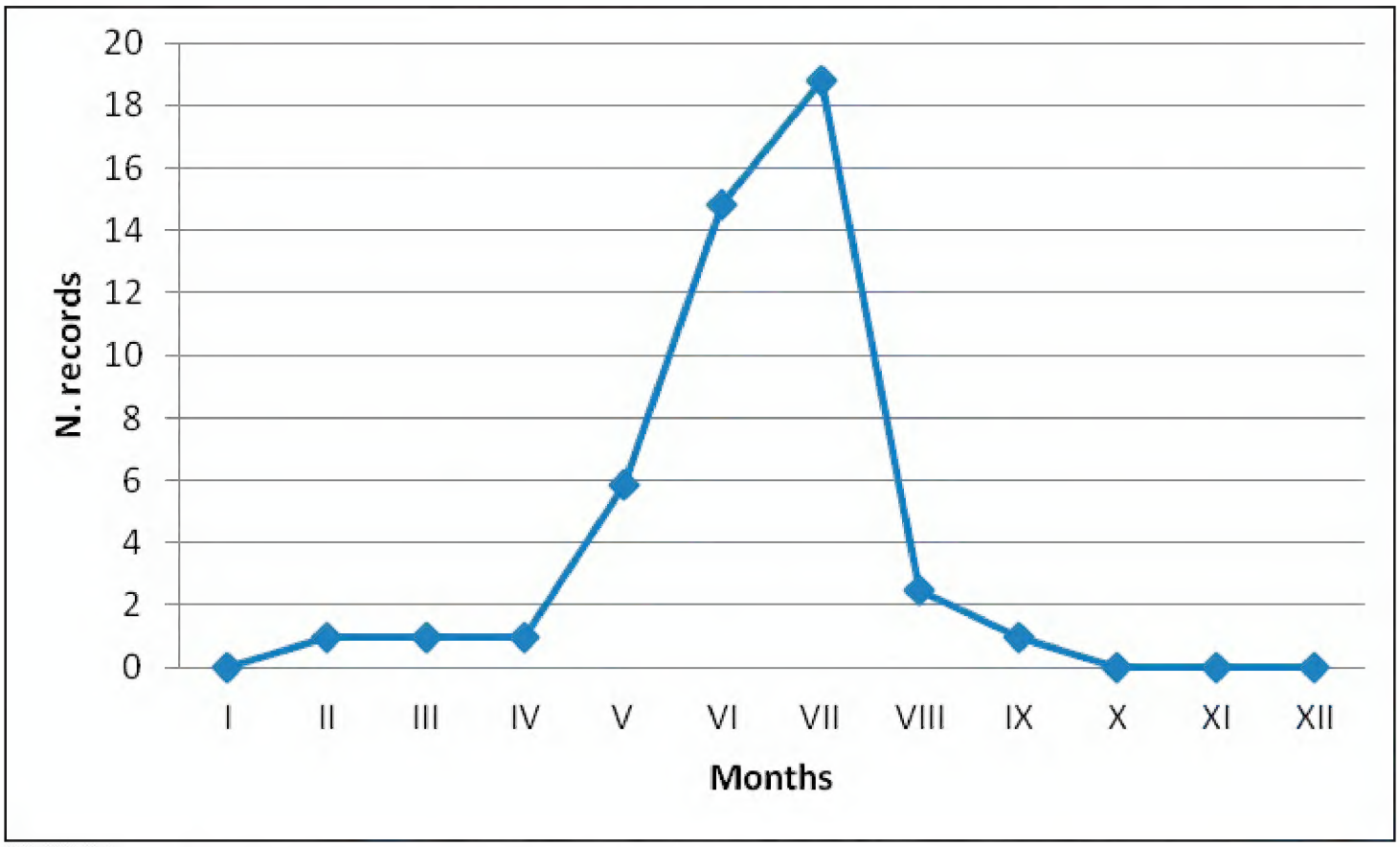

Figure 2. Italian phenology of *Lichenophanes varius*.

(http://www.wsmipp2017.eu/) by an aerial trap placed on a *Q. cerris* tree (cf. Bardiani et al. 2017). No *Biscogniauxia* species is recorded from this locality, where other fungi of the same family occur (Consiglio et al. 2007, E. Minari pers. comm.). *Biscogniauxia nummularia* occurs in the above site of Campania (cf. Persiani et al. 2010) and, in this place, *L. varius* was reared from branches of *Q. cerris* colonized by *Biscogniauxia* sp. (Nardi and Biscaccianti this paper). Previously, *L. varius* was known from Campania only on the basis of very old records (cf. Muscarella et al. 2013) and most of the woods of these sites appear now unsuitable for the development of this species (cf. Massa and Massa 1980, Cona and Di Pasquale 2007). The record from Calabria is the first for this region, where a single specimen was reared from branches of *Q. frainetto* apparently free of fungi. In Italy, this *Quercus* species was previously unrecorded as host-plant of *L. varius* (cf. Muscarella et al. 2013).

The above records from Lazio have been already published (Redolfi de Zan et al. 2014), but without the label's data. These specimens were obtained using two kinds of aerial traps: transparent cross windows flight trap and black cross windows flight trap (cf. Redolfi de Zan et al. 2014).

The global warming, can favour an expansion of the range of alien species (cf. Walther et al. 2009, Tobin et al. 2014, Rassati et al. 2016), but also those of some autoctonous species such as *L. varius* (Geis 2016). In fact, in recent years, in response to climate change, there has been a resurgence of attacks from the above phytopathogenic fungi in Italian forest stands (Franceschini et al. 2009) and, this resurgence can probably favour the populations of this red-listed species (cf. Muscarella et al. 2013).

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